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# USERS GUIDE TO THE REPORT GENERATOR FOR THE NAVY RESOURCE MODEL

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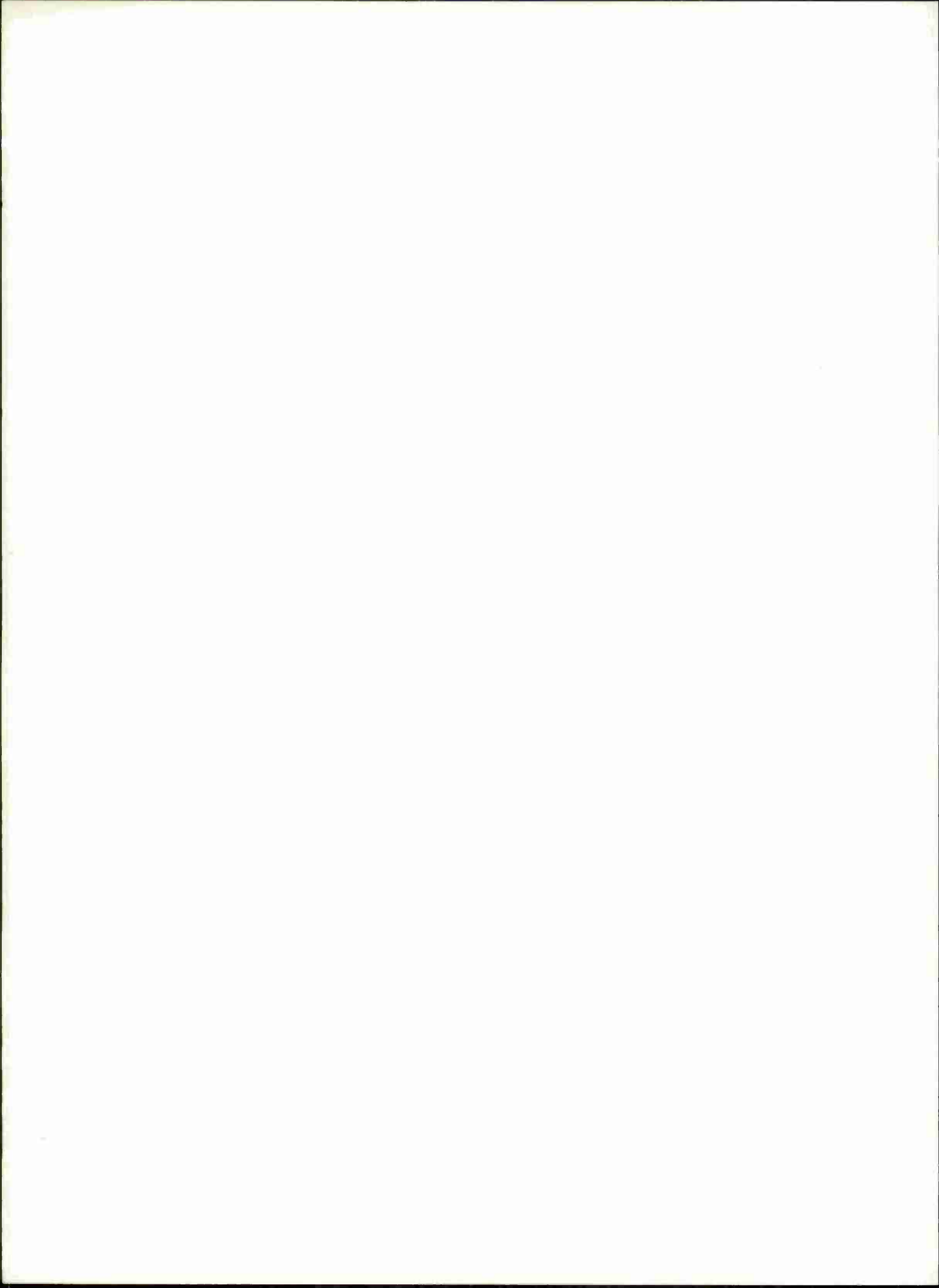
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This Report Generator is a highly generalized information-extracting and report-formatting computer routine. Through a sophisticated command language and system of dictionaries, it can report out information in countless formats and degrees of detail. The description of the Report Generator in this users guide is for the dictionaries and data files used in the Navy Resource Model (NARM) at CNA. However, it is possible for the reader to apply the Report Generator to his own management information system by creating his own dictionaries for his own data tapes. How to (over)		

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<sup>20</sup>create dictionaries is described in this guide.

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2. This Research Contribution is intended for managers, analysts, and computer programmers who are involved in governmental program planning. Although to date the Report Generator has been used primarily with the Navy Resource Model, it can be used with other, similar management information systems.
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## FOREWORD

The Navy Resource Model (NARM) is a tool for estimating the total resource requirements of alternative Navy programs. Given data that describes a base year, and a force structure of ships and aircraft that is desired in future years, it will develop consistent funding and manning estimates for those years.<sup>1</sup>

The Report Generator is a separate computer program written by Joseph David Kinkade that has been applied as part of the NARM system. Its function is to display the data contained in the input and output files of the NARM.

The NARM contains data on all Navy appropriations, personnel, and forces. Cost factors, forces, and other input data are contained on a "working data," or WData, file. This file is used by the NARM's cost computation model to estimate costs and other resource requirements. The results of these computations are put onto a "result data," or RData, file. Both files can be accessed and displayed by the Report Generator.

The Report Generator can display the Program Objectives Memorandum (POM) in the Program Element Summary Data format required by OSD. It can also display the same POM data in a variety of other levels of detail and formats. This capability made possible, for example, the creation of the Navy's Resource Analysis Display, which is a management information document that displays the resources of each Navy mission sponsor and platform sponsor. It also facilitated the creation of the POM procurement annex, in which each procurement appropriation is displayed by budget line item over several years. These data can be aggregated over the entire data file, or any portion of it.

Operation of the Report Generator does not require knowledge of computer programming. Most reports can be obtained with only a basic knowledge of how to execute existing computer programs, plus some familiarity with the NARM data files and Report Generator commands.

On the other hand, an experienced user with considerable familiarity with the Report Generator would be challenged to identify all the permutations of reports that are possible. Rudimentary arithmetic calculations can be performed on the data base, prior to reporting the data. At the hands of an expert and innovative user, the Report Generator is capable of producing reports not yet conceived.

---

<sup>1</sup>For more information about the NARM, see (CNA)1684-72, "An Introduction to the NARM."

This document shows how to use the Report Generator to display NARM data. However, it also makes apparent the considerable flexibility of the Report Generator, which makes it suitable for other data systems, including those outside of the Navy and of the Department of Defense.

Kenneth A. Goudreau

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## ELEMENTS OF THE NARM AND REPORT GENERATOR

### Program Units and Program Elements

The Navy Resource Model views the Navy as a collection of resources: ships, aircraft, personnel, and money (appropriations). The NARM categorizes these resources according to the parts of the Navy's organization with which they are associated: force units (e.g. SSBN-598 class submarines), sectors of the shore establishment (e.g. recruit training centers), procurement accounts, or RDT&E projects. Each category is referred to as a "program unit" or PU.

Each PU is coded with an 8 digit numeric identifier (PU code) for use within the NARM. The PU code permits detailed definition within force units. For example, ship forces are identified first as ships; next by status - active, reserve, etc.; then by type - submarine, destroyer, etc.; then by class within type, such as the Polaris class of submarine; and finally by major claimant - CINCLANTFLT, CINCPACFLT, etc.<sup>1</sup>

The DoD Planning, Programming, and Budgeting System (PPBS) categorizes the Navy's resources in a different, though parallel, way. The PPBS divides the Navy into "program elements," which are the smallest building blocks in the Navy's Five Year Defense Plan (FYDP). Examples of such categories are aircraft squadrons by model or function, ships and support activities by function, and RDT&E by project.

Program elements (PEs) are aggregated into defense planning and programming categories. It is at this level of detail that the DoD PPBS establishes program constraints. Examples of categories are Strategic Offensive Forces, Mobility Forces, and Base Operating Support.

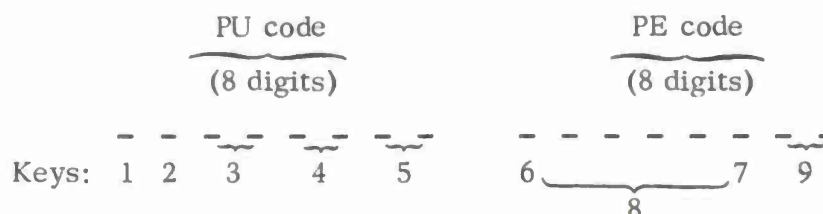
PEs are represented in the PPBS by a 5 digit number plus a letter designating service. Examples are Sea Control Ships, 24241N; F-14 Squadrons, 24144N; Surface Missile Warhead Development, 64365N. PEs are coded in the NARM by an 8 digit numeric identifier which couples the 6 digit program element (including one digit for Service identification - "2" for Navy and "3" for Marine Corps) with a 2 digit defense planning and programming category.

Each NARM program unit may correspond to more than one DoD program element. For example, the program unit representing the aircraft carrier Constellation (CVA/CV 64) corresponds to both PE 24111N (Attack Aircraft Carriers) and PE 24112N (Multi-purpose Aircraft Carriers). Conversely, each program element may correspond to more than one program unit. For example, PE 24453N (Fleet Support Squadrons) includes PUs representing A-3B aircraft, C-9B aircraft, etc.

<sup>1</sup>The claimant is an office within the Navy that is responsible for an aggregation of resources or activities. The claimant for aircraft procurement is NAVAIR.

## Keys

Program unit and program element codes have been constructed systematically so that certain digits or combinations of digits within these codes have meaning by themselves. Hence, they allow the user to key on a particular part of the PU or PE code to produce summary reports. The Report Generator recognizes 9 such keys:



The meanings of the keys are as follows:

<u>Key</u>	<u>Meaning</u>
1	PU type: ships, aircraft, thruputs, variable support, or personnel support
2, 3, 4	Depends on PU type selected (see table 1)
5	Claimant
6	DoD program
7	Service (Navy or Marine Corps)
8	Program element
9	Defense planning and programming category

For example, PU code 11020560 represents the aircraft carrier Coral Sea in the Atlantic Fleet:

Key 1 = "1" indicates PU 1, ships  
Key 2 = "1" indicates active status  
Key 3 = "02" indicates aircraft carrier type  
Key 4 = "05" indicates CVA 43 class  
Key 5 = "60" indicates Atlantic Fleet claimant

PU code 22081070 represents all A-6E aircraft in the Pacific Fleet:

Key 1 = "2" indicates PU 2, aircraft  
Key 2 = "2" indicates VAM medium attack model  
Key 3 = "08" indicates sub-class A-6  
Key 4 = "10" indicates series A-6E  
Key 5 = "70" indicates Pacific Fleet claimant

**TABLE 1**  
**PROGRAM UNIT KEY DESIGNATIONS AND DEPENDENCES**

PU type	Key	Designation	Key dependence
PU1 (key 1 is 1)	1	Ships	
	2	Status	Key 1
	3	Type	Key 1
	4	Class	Key 3
PU2 (key 1 is 2)	1	Aircraft	
	2	Model	Key 3
	3	Sub-Class	Key 1
	4	Series	Key 3
PU5 (key 1 is 5)	1	Thruputs	
	2	Appropriations/thruput	Key 1
	3	Thruput	Key 2
	4	Thruput	Key 3
PU7 (key 1 is 7)	1	Variable support (mostly logistic)	
	2	(Not used)	
	3	Sector	Key 1
	4	(Not used)	
PU8 (key 1 is 8)	1	Personnel support	
	2	Category	Key 1
	3	(Not used)	
	4	(Not used)	

#### PU and PE Dictionaries

The meaning of a PU or PE code must be supplied to the Report Generator for it to produce intelligible reports. This is supplied in PU and PE dictionaries, which associate titles with key values. The dictionaries consist of card images. Columns 9-72 are the title field which will be printed when the key values of the PU or PE number are used by the Report Generator. Columns 1-8 are the PU code (keys 1 through 5) or PE code (keys 6 through 9).

#### Data Record and Sequence Numbers

A record in the data file consists of the pairing of a PU and a PE code and up to 150 rows of data. Each row contains up to 12 years of data on a variable that is pertinent to that PU-PE pair. The variable is a resource (e.g., number of enlisted personnel) or a factor used to calculate a resource (e.g., number of enlisted personnel per ship). Thus, a single record can be visualized as a matrix in which the rows represent variables and the columns represent years.

Two examples of data records on a WDATA tape are shown in figure 1. PU code 11021270 (CVA/CV 63 - Kitty Hawk, Pacific Fleet) is paired with PE code 24111213 (24111N, Attack Carriers, Tactical Air Forces) and with PE code 24112213 (24112N, Multipurpose Aircraft Carriers, Tactical Air Forces). Row numbers (usually called "sequence numbers") are used to designate the variables in the matrix. Sequence number 16, for example, contains the fuel cost for this ship in dollars per barrel for 12 years. The meanings of sequence numbers depend on the file (WData or RData) and on the type of PU (ships, aircraft, support, etc.).

### Stubs

The quantities that can be computed from the data and reported by the Report Generator are called stubs. Stubs are described to the Report Generator by means of a stub dictionary. The stub dictionary contains stub names and their descriptions. A stub description supplies the Report Generator three kinds of information about the stub: the title by which it is to be identified in reports, its unit of measure (money, personnel, forces, etc.), and how to compute it.

A stub is usually computed by summing data from one or more sequence numbers in one or more PU-PE pairs. Consider, for example, the stub entitled "Ships Operations and Maintenance, Navy," which refers to the O&MN appropriation of ship PUs. This information is carried on an RData tape. Since total O&MN is not carried in the NARM data base for ship PUs, the Report Generator must aggregate the components of this appropriation, which are carried. The stub description identifies the sequence numbers that contain the cost components, in this case sequence numbers 8, 13, 14, 18, 20, 23, 25, and 31. These sequence numbers designate the following components of O&MN:

<u>Sequence number</u>	<u>Title</u>
8	Annualized Ship Overhaul Cost
13	Conventional Fuel Cost per Year
14	Utilities Cost per Year
18	Non-Selected Restricted Availability Cost per Year
20	Repair Parts Consumption per Year
23	Tender Availability Cost per Year
25	Other Ships O&MN Cost per Year
31	Fleet TAD Cost per Year

The stub would be computed by summing these components across all ship PUs.

Some stubs can be computed by combining the results of other stubs. For example, the stub "Ships Operating Cost" is the sum of the stubs "Ships Military Personnel, Navy" and "Ships Operations and Maintenance, Navy."

More complicated stub computations can also be performed. Constants supplied by the user can be used in combining fractions or multiples of values on the data file or to alter the data before reporting. How to construct a stub is described later.

PU	PE	SEQ	FY 1	FY 2	FY 3	FY 4	FY 5	FY 6	FY 7	FY 8	FY 9	FY 10	FY 11	FY 12
11021270	24111213	2	1.00	1.00	1.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11021270	24111213	3	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00
11021270	24111213	4	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
11021270	24111213	5	32501.00	32500.00	32500.00	32200.00	31400.00	31400.00	31400.00	31400.00	31400.00	31400.00	31400.00	31400.00
11021270	24111213	6	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00
11021270	24111213	8	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	603.00
11021270	24111213	12	252.00	252.00	252.00	252.00	252.00	252.00	252.00	252.00	252.00	252.00	252.00	252.00
11021270	24111213	13	223.00	223.00	223.00	223.00	223.00	223.00	223.00	223.00	223.00	223.00	223.00	238.00
11021270	24111213	14	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	147.00
11021270	24111213	15	32.90	32.90	32.90	32.90	32.90	32.90	32.90	32.90	32.90	32.90	32.90	32.90
11021270	24111213	16	5.54	5.54	7.77	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
11021270	24111213	17	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	58.00
11021270	24111213	18	274.00	274.00	274.00	274.00	274.00	274.00	274.00	274.00	274.00	274.00	274.00	274.00
11021270	24111213	19	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	950.00
11021270	24111213	21	129.00	129.00	129.00	132.00	132.00	132.00	132.00	132.00	132.00	132.00	132.00	132.00
11021270	24111213	22	2638.00	2644.00	2642.00	2687.00	2713.00	2741.00	2741.00	2741.00	2741.00	2741.00	2741.00	2741.00
11021270	24111213	25	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60
11021270	24111213	32	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00
11021270	24111213	33	4.30	4.30	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	0.00	3.00
11021270	24111213	100	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
11021270	24112213	1	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
11021270	24112213	3	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00
11021270	24112213	4	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
11021270	24112213	5	32500.00	32500.00	32500.00	32243.00	31400.00	31400.00	31400.00	31400.00	31400.00	31400.00	31400.00	31400.00
11021270	24112213	6	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00	1654.00
11021270	24112213	8	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	1356.00	603.00
11021270	24112213	12	252.00	252.00	252.00	252.00	252.00	252.00	252.00	252.00	252.00	252.00	252.00	252.00
11021270	24112213	13	223.00	223.00	223.00	223.00	223.00	223.00	223.00	223.00	223.00	223.00	223.00	238.00
11021270	24112213	14	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	128.00	147.00
11021270	24112213	15	32.90	32.90	32.90	32.90	32.90	32.90	32.90	32.90	32.90	32.90	32.90	32.90
11021270	24112213	16	5.54	5.54	7.77	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
11021270	24112213	17	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	58.00
11021270	24112213	18	274.00	274.00	274.00	274.00	274.00	274.00	274.00	274.00	274.00	274.00	274.00	274.00
11021270	24112213	19	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	950.00
11021270	24112213	21	129.00	129.00	129.00	132.00	132.00	132.00	132.00	132.00	132.00	132.00	132.00	132.00
11021270	24112213	22	2638.00	2644.00	2642.00	2687.00	2713.00	2741.00	2741.00	2741.00	2741.00	2741.00	2741.00	2741.00
11021270	24112213	25	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60	37.60
11021270	24112213	32	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00	3091.00
11021270	24112213	33	4.30	4.30	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	0.00	3.00
11021270	24112213	34	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11021270	24112213	35	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11021270	24112213	100	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

FIG. 1: LISTING FROM WDATA FILES

## REQUESTING A REPORT

### REQUIRED COMMANDS

#### General

The job control cards necessary to run the Report Generator on the CDC 3800 at CNA are shown in figure 2. Note that four tapes are equipped as follows:

<u>Logical unit</u>	<u>Tape</u>
3	WData or RData file
4	Dictionary
5	Report Generator load and go
7	Preprocessor load and go

The preprocessor creates a random access file from the data tape in preparation for the operation of the Report Generator. This file (RA) must also be equipped, on logical unit 2. The "(5)" on the first control card is needed to make sure that adequate disk storage is allocated.

CNA COMPUTER JOB REQUEST

LAST NAME DAVIS	TEL 392	REMARKS	JOB NO 1 of 1	SVC PRTY P	SEQUENCE NO.
--------------------	------------	---------	------------------	---------------	--------------

UNCLAS ☒ CONF ☐ SECRET ☐

INPUT DECK ☒ ☐ ☐

PRINTOUT ☒ ☐ ☐

PLOTTER OUTPUT ☐ ☐ ☐

CARD OUTPUT ☐ ☐ ☐

REPRODUCTION? ☐

NO. \_\_\_\_\_ REPRODUCTION? ☐

NO. \_\_\_\_\_ INTERPRET? ☐

LUN	REEL NO.	WRITE	L.C.1	TAPE LABEL NAME	D	*	CLASS
3	1963			RD-1OCT-9			
4	364			DRG ALLOCAT-POM			
5	210			R.G.-LGO1			
7	186			PLOAD-LGO			

FIG. 2: JOB CONTROL CARDS

Commands displayed in figure 2 and elsewhere are typed with exact spacing and formatting to be used in coding. Output that has been typed reflects exact formatting and spacing produced by the Report Generator.

In formulating the request for a report, the user need only describe the report he seeks and specify a data file and dictionaries consistent with each other and with the report desired. The desired report is described to the Report Generator by means of one or more KEYS commands and STUBS commands (and perhaps selected optional commands on format, etc.). Broadly speaking, the STUBS command specifies the information to be reported and the KEYS command the PU-PE pairs the information is for. The KEYS command also specifies the level at which to report the information. The data file to be used is specified on a data file EQUIP card (see figure 2). The PU, PE and stub dictionaries are specified in three dictionary commands - STUBDICT, PUDICT, and PEDICT - that tell the Report Generator which of the many files on the dictionary tape to look at.

When several reports are called for in one job, a REPORT command is required at the end of each report description except the last, which is followed by an end of file statement or an END command if the system does not require an EOF card. If the dictionaries to be used by the Report Generator in this multiple-report run are the same through two or more reports, they need not be respecified for the succeeding report or reports.

The Report Generator sorts the commands, so they may appear in any order following the job control cards.

Figure 3 shows the command cards that were used in a run that generated two reports that will be shown later in figures 5 and 6.

### Coding Commands

Report Generator commands have the following general format:

name    operand    comments

The name of the command begins in card column 1. The three fields are delimited each by a blank. Blanks are allowed in the operand field within titles enclosed by parentheses, and in the comment field. Commas are used as delimiters in the operand. Prior to card column 73, the operand field must be terminated by a blank outside of parentheses or continued to another card by an 11-8-6 punch (down arrow on the CDC). The comment field will appear only in the command listing for the report where it was used. Comments would be included if a user wanted to document the logic behind the structure of particular commands.

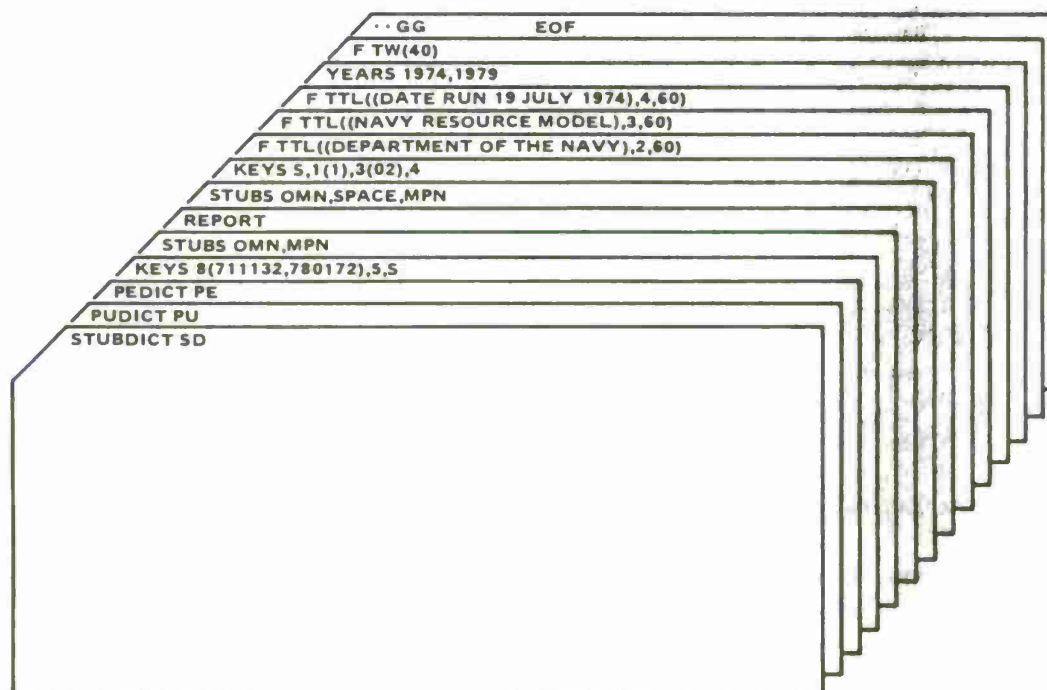


FIG. 3: COMMAND CARDS FOR ILLUSTRATIVE  
STANDARD REPORTS

The structure of the required commands is summarized in table 2.

### Illustrative Run

Let us say that we should like to see the O&MN and the MPN dollars in PEs 71113N and 78017N. Let us say further that we should also like to see what claimants this money has been divided among.

Since O&MN and MPN are frequently used stubs, they are probably already in one of the existing stub dictionaries. Existing dictionaries are nothing more than collections of stub descriptions created by previous users of the Report Generator. If the desired stubs are not in any of the dictionaries, or perhaps different titles are desired, new stubs may be created and entered into the dictionary (see "Constructing a Stub Dictionary").

Suppose that we have already specified which data file and dictionary files are to be used, and that the dictionary commands are as follows:

STUBDICT SD  
PUDICT PU  
PEDICT PE

**TABLE 2**  
**FORM OF REQUIRED COMMANDS**

Name	Abbrev.	Operand
KEYS	K	S key number(range)
PEDICT	PE	name of dict. file: PE
PUDICT	PU	file name: PU OPNPU APNPU WPNPU RDP MILCONPU
REPORT	R	
STUBS	S	stub name(picture) SPACE EJECT
STUBDICT	SD	file name: SD TRAMOD FACBK WSSD RWKSD WSTUBS

We must now look at the stub dictionary specified, SD, to find the names of the stubs we wish to see reported. In this case they are "OMN" and "MPN". These names then are put in the STUBS command, in the order in which they are to be reported, like this:

STUBS OMN,MPN

Having seen earlier that program element is key 8 and claimant is key 5, we write the KEYS command like this:<sup>1</sup>

KEYS 8(711132,780172).5.S

We put key 8 before key 5 in the command to make program element a higher level of heading than claimant in the report. Apart from the sequence of keys 1-4 demanded by key dependence, any sequence of keys in the command is allowed.

<sup>1</sup>Although on the data file data is associated with both a PU and a PE code (PU-PE pair), in getting out information it is not necessary to specify both in the KEYS command, for each key may be used separately.

The PE codes in parentheses after key 8 specify the values the key may have. These are termed the "range" of the key. When all values between two limits are to be specified, only the limits, joined by a hyphen, need be expressed.

The "S" in the KEYS command represents the level at which to report the two stubs: computed stubs are summed up to the level of the placement of the "S". Because the "S" has been placed to the right of the specified keys in the above command, the two stubs will be the breakdown under each claimant:

71113N PROCUREMENT OPERATIONS  
NAVORD  
OPERATIONS & MAINTENANCE, NAVY  
MILITARY PERSONNEL, NAVY

If the "S" were placed between key 8 and key 5

KEYS 8(711132,780172),S,5

the stubs would be totalled across all claimants and the claimants would be the breakdown under each of the two stubs:

71113N PROCUREMENT OPERATIONS  
OPERATIONS & MAINTENANCE, NAVY  
NAVORD  
NAVAIR  
NAVSUP  
NAVSHIPS  
TOTAL OPERATIONS & MAINTENANCE, NAVY

If the "S" were placed to the left of key 8

KEYS S,8(711132,780172),5

each of the two stubs would be totalled across both PEs, and the PEs would be the first breakdown under a stub:

OPERATIONS & MAINTENANCE, NAVY  
71113N PROCUREMENT OPERATIONS  
NAVORD  
NAVAIR  
NAVSUP  
NAVSHIPS  
TOTAL 71113N PROCUREMENT OPERATIONS

78017N MAINTENANCE SUPPORT ACTIVITIES  
NAVORD  
NAVAIR  
NAVSUP  
NAVELEX  
TOTAL 78017N MAINTENANCE SUPPORT ACTIVITIES  
TOTAL OPERATIONS & MAINTENANCE, NAVY

When "S" is omitted, the Report Generator acts as though it had been placed to the right of all specified keys. "Total" lines are generated automatically in the last two cases because there is a lower level of detail than stubs. If we wished to see a total of OMN and MPN together, we should have to include another stub name, OMNMPN, in the STUBS command.

Figure 4 lists the commands we have given to the Report Generator and the stubs it uses to generate the report, as they appear in the stub dictionary. This listing is printed out immediately before the report. It often includes stubs which were not specified in the STUBS command but which are needed to create those that are. Thus, "Ships O&MN," "Aircraft O&MN," "Other O&MN," and "Support O&MN" constitute OMN. Ships and Aircraft O&MN are the sums of other stubs: overhaul and fuel costs, flight ops, air TAD, etc. The stub listing shows everything that was added together to yield the final stub.

Any misspecified Report Generator command will be ignored. If it is a required command, the report will be aborted. In any case, an error message will appear in the command listing. Similarly, parity errors will be noted next to the stub or dictionary involved.

The report we requested is shown in figure 5. Note in the title column the outline of headings and the indentation that were established by the KEYS command. Had we not specified a range for key 8 (PE), this order would be repeated for all PEs. Note also that because we didn't include FORMAT commands for spacing, the titles are packed together in hard-to-read fashion and that the report is crammed near the top of the page. Note further that blanks appear in place of zero values.<sup>1</sup> (Zeros would appear in place of values less than 0.5.) Finally, since we did not limit the number of years to be reported, all years are printed, up to a maximum of 14. (The maximum number of years on a data file, however, is 12.)

---

<sup>1</sup> If there are no non-zero values for an entire line in the report, that line, title and all, is not printed.

STUBDICT SD  
DICTIONARY COPIED OK

PUDICT PU  
DICTIONARY COPIED OK

PEDICT PE  
DICTIONARY COPIED OK

KEYS 8(711132,780172),5,S

STUBS OMN,MPN

STUBS DESCRIPTIONS-

OMN	TTL(OPERATIONS + MAINTENANCE, NAVY),↓
OMN	INCLUDE(OMNS,OMNA,OMNO,OMNSUP)
MPN	TTL(MILITARY PERSONNEL, NAVY),↓
MPN	IF(1(1)),R(29)
MPN	IF(1(2)),R(10)
MPN	IF(1(5,7)),R(1)
OMNS	TTL((SHIPS O+MN),1)↓
OMNS	INCLUDE(OMNSOC,OMNSCF,OMNSUT,OMNSRA,OMNSRP,↓
OMNS	OMNNRA,OMNSTA,OMNSOS,OMNSFT)
OMNA	TTL((AIRCRAFT O+MN),1),↓
OMNA	INCLUDE(OMNAFO,OMNAAT,OMNAO)
OMNO	TTL((OTHER O+MN),1),IF(1(5)),R(6)
OMNSUP	TTL((SUPPORT O+MN),1),IF(1(7)),R(2)
OMNSOC	TTL((OVERHAUL COSTS),2),IF(1(1)),R(8)
OMNSCF	TTL((CONVENTIONAL FUEL),2),IF(1(1)),R(13)
OMNSUT	TTL((UTILITIES),2),IF(1(1)),R(14)
OMNSRA	TTL((SELECTED RESTRICTED AVAIL),2),IF(1(1)),R(34)
OMNSRP	TTL((REPAIR PARTS CONSUMPTION),2),IF(1(1)),R(20)
OMNNRA	TTL((NONSELECTED RESTRICTED AVAIL),2),IF(1(1)),R(18)
OMNSTA	TTL((TENDER AVAILABILITY),2),IF(1(1)),R(23)
OMNSOS	TTL((TOERH SHIPS O+MN ),2),IF(1(1)),R(25)
OMNSFT	TTL((FLEET TAD),2),IF(1(1)),R(31)
OMNAFO	TTL((FLIGHT OPS),2),IF(1(2),2(1-6,8-9)),R(4)
OMNAAT	TTL((AIR TAD),2),IF(1(2)),R(18)
OMNAO	TTL((OTHER AIRCRAFT O+MN),2),IF(1(5)),R(5)

FIG. 4: LISTING OF COMMANDS AND STUBS

	FY72	FY73	FY74	FY75	FY76	FY77	FY78	FY79	FY80	FY81
	(\$ MILLIONS)									
71113N PROCUREMENT OPERATIONS										
NAVORD										
OPERATIONS : MAINTENANCE, NAVY	4.8	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
MILITARY PERSONNEL, NAVY	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3
NAVAIR										
OPERATIONS : MAINTENANCE, NAVY	18.2	14.7	13.9	12.8	12.8	12.8	12.8	15.1	15.1	15.1
MILITARY PERSONNEL, NAVY	1.4	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1
NAVSUP										
OPERATIONS : MAINTENANCE, NAVY	25.1	21.4	20.4	19.7	19.3	19.7	19.7	20.9	20.9	20.9
MILITARY PERSONNEL, NAVY	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
NAVSHIPS										
OPERATIONS : MAINTENANCE, NAVY			35.2	32.2	32.2	32.2	32.2			
78017N MAINTENANCE SUPPORT ACTIVITIES										
NAVORD										
OPERATIONS : MAINTENANCE, NAVY	124.8	114.5	134.8	134.7	118.8	122.3	121.8	131.6	133.4	132.7
NAVAIR										
OPERATIONS : MAINTENANCE, NAVY	94.2	83.7	90.0	83.1	77.3	76.7	75.6	84.3	85.3	83.5
MILITARY PERSONNEL, NAVY	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3
NAVSHIPS										
OPERATIONS : MAINTENANCE, NAVY	75.5	67.6	85.1	81.1	78.9	79.7	82.4	95.5	97.6	101.8
NAVELEX										
OPERATIONS : MAINTENANCE, NAVY	35.5	35.2	36.6	31.1	29.0	28.8	28.9	37.7	38.2	38.1

FIG. 5: STANDARD REPORT

Suppose in our next report we should like to see O&MN and MPN for aircraft carriers by class. The STUBS command would be the same as before but the KEYS command would now be

KEYS S, 1(1), 3(02), 4

These commands would produce the report seen in figure 6. Use of optional commands (shown in figure 3) has improved the appearance of the report over that of figure 5. We have improved the spacing, added titles, and reduced the number of years reported to six.

It is also possible to obtain a report with no breakout by keys. For example, if one wanted to see only two grand totals of the entire data file for O&MN and MPN, the following commands would be used:

KEYS  
STUBS OMN, MPN

Although we have no keys specified, the KEYS card must be included, since it is a required command.

#### Additional Operands of the STUBS Command

In addition to stub names the STUBS command may contain EJECT or SPACE, thus:

STUBS OMN, SPACE, MPN, EJECT

SPACE would cause one print line to be skipped before MPN was printed. (SPACE, SPACE would cause two print lines to be skipped.) EJECT would cause the OMN and MPN for each claimant to appear on a separate page, if stubs were the lowest level of detail in the KEYS command.

The format of the numeric results can be altered by including a parenthesized "picture" following the stub name. A picture determines the placement of the decimal point and imbedding of commas to denote the thousands positions. An example of a picture is:

STUBS OMN(9,999,999.99), MPN(9), MULT(9.9999)

The OMN stub would imbed commas and provide decimal accuracy rounded to two places. The MPN stub would round any decimal fraction to the nearest integer. The MULT stub would provide decimal accuracy rounded to four places. In the absence of a picture, the standard form of results is 9.9 .

DEPARTMENT OF THE NAVY  
NAVY RESOURCE MODEL  
DATE RUN 19 JULY 1974

	FY74	FY75	FY76	FY77	FY78	FY79
	(\$ MILLIONS)					
OPERATIONS & MAINTENANCE, NAVY						
SHIP FORCES						
AIRCRAFT CARRIERS (CVA/CV)						
CVA 19 (HANCOCK)	6.2	3.1				
CVA 34 (CRISKANY)	6.4	3.2				
CVA 42 (FRANKLIN D ROOSEVELT)	6.8	6.8	3.4			
CVA 43 (CORAL SEA)	8.3	8.3	4.1			
CVA 41 (MIDWAY)	8.1	8.1	33.1	8.1	8.1	8.1
CVA/CV 59 (FORRESTAL)	6.6	6.6	27.6	6.6	6.6	6.6
CVA/CV 60 (SARATOGA)	6.6	6.6	6.6	6.6	6.6	32.4
CVA/CV 61 (RANGER)	8.8	8.8	8.8	41.6	8.8	8.8
CVA/CV 62 (INDEPENDENCE)	6.8	6.8	6.8	6.8	32.6	6.8
CVA/CV 63 (KITTY HAWK)	9.3	9.3	42.1	9.3	9.3	9.3
CVA/CV 64 (CONSTELLATION)	11.3	42.1	9.5	9.5	9.5	9.5
CVA/CV 66 (AMERICA)	9.5	33.3	7.5	7.5	7.5	7.5
CVA/CV 67 (J.F. KENNEDY)	25.0	6.6	6.6	6.6	6.6	32.4
TOTAL AIRCRAFT CARRIERS (CVA/CV)	119.7	149.6	156.1	102.6	95.6	121.4
TOTAL SHIP FORCES	119.7	149.6	156.1	102.6	95.6	121.4
TOTAL OPERATIONS & MAINTENANCE, NAVY	119.7	149.6	156.1	102.6	95.6	121.4
MILITARY PERSONNEL, NAVY						
SHIP FORCES						
AIRCRAFT CARRIERS (CVA/CV)						
CVA 19 (HANCOCK)	16.7	8.5				
CVA 34 (CRISKANY)	17.0	8.7				
CVA 42 (FRANKLIN D ROOSEVELT)	20.8	21.1	10.6			
CVA 43 (CORAL SEA)	21.1	21.5	10.8			
CVA 41 (MIDWAY)	21.2	21.5	21.6	21.5	21.5	21.4
CVA/CV 59 (FORRESTAL)	23.1	23.5	23.5	23.7	23.8	23.8
CVA/CV 60 (SARATOGA)	24.0	24.6	24.7	24.7	24.6	24.6
CVA/CV 61 (RANGER)	23.1	23.5	23.8	23.9	23.8	23.8
CVA/CV 62 (INDEPENDENCE)	24.5	25.0	25.1	25.0	25.0	25.0
CVA/CV 63 (KITTY HAWK)	23.3	23.9	24.0	23.9	23.9	23.9
CVA/CV 64 (CONSTELLATION)	23.2	23.8	24.1	24.1	24.2	24.1
CVA/CV 66 (AMERICA)	23.4	24.0	24.1	24.0	23.9	23.9
CVA/CV 67 (J.F. KENNEDY)	23.1	23.7	24.0	23.9	23.8	23.8
TOTAL AIRCRAFT CARRIERS (CVA/CV)	284.5	273.4	236.2	214.7	214.5	214.3
TOTAL SHIP FORCES	284.5	273.4	236.2	214.7	214.5	214.3
TOTAL MILITARY PERSONNEL, NAVY	284.5	273.4	236.2	214.7	214.5	214.3

FIG. 6: STANDARD REPORT

The rules for pictures are as follows:

- A picture can be made up of no more than 12 characters.
- The only characters allowed are 9's, commas, and a decimal point.
- Only the 9's are replaced with digits from the number to be printed.
- Up to 11 digits can be handled safely.

## OPTIONAL COMMANDS

A number of optional commands give more capability to select and format the data that is to be reported. The structure of these commands is summarized in table 3.

### Other Commands Involving Keys

The EDIT command is used to modify (for one report only) the values of one or more keys. This is useful for summing things together to be reported with a special stub dictionary. (This is the way to generate a fiscal guidance summary from mission category data.) It is also convenient for setting a key value for an unused key to be used as a "switch" in later accepting or rejecting the record. If there is more than one EDIT command, the editing operations are performed in the order in which the commands were specified. Example:

EDIT (9(71), 19)

This example tells the Report Generator to give key 9 the new value 19 in place of the old value 71.

As shown in table 3, the ACCEPT and REJECT commands allow you to reject records whose keys are within the ranges specified in the KEYS command. The ACCEPT command serves no function unless it is accompanied by one or more REJECT commands. As each data record is examined, the ACCEPT and REJECT commands are scanned in the order in which they were specified. If any ACCEPT or REJECT command is found for which the condition expressed is true, or on which there is no condition, the Report Generator stops its scan for ACCEPT or REJECT conditions and performs the following actions: if a REJECT condition is satisfied, the record is skipped; if an ACCEPT condition is satisfied, the result is the same as if there had been no ACCEPT or REJECT command. Scanning is continued, but when an ACCEPT or REJECT command specifies a record previously skipped, the command is ignored. Therefore, in order to avoid rejecting a record that you want reported, the ACCEPT command must precede any REJECT commands that affect that record. For example, if one wishes to reject all records of keys 1 and 7 except 1(2), 7(3), Marine Corps aircraft, the required sequence of commands would be: ACCEPT (1(2), 7(3)), REJECT (1, 7). If the ACCEPT command came after the REJECT command all records of keys 1 and 7 would be skipped.

**TABLE 3**  
**FORM OF OPTIONAL COMMANDS**

Name	Abbrev.	Operand
EDIT	E	(key(range),new key value,condition)
ACCEPT		(key(range),condition)
REJECT		(key(range),condition)
ONKEY	ON	key. $\left\{ \begin{array}{l} \text{UNPRINT,} \\ \text{EJECT,} \\ \text{SPACE(n),} \end{array} \right\}$ condition
FORMAT	F	TTL((title),line,column) PAGENO(line,column,length) PENO(line,column) PETTL(line,column)
	YW	YEARWIDTH(number)
	TW	TITLEWIDTH(number)
	S	STANDARD
	NS	NONSTANDARD(line,line)
		TOTAL
		NOTOTAL
		ATYPE
		CTYPE
		NTYPE
		MBUCKS
		KBUCKS
		KEYS
		NOKEYS
DETAIL		key
FDETAIL		key
YEARS		year,year
FYEARS		year,year
TERSE	T	ON OFF
TIME		ON OFF
STATISTICS		ON OFF
DEBUG		ON OFF
WRITE		
ENDFILE		

The ONKEY command specifies carriage control for the printed reports. Any key specified in the KEYS command, or an "S", may be the control value. Each time the Report Generator encounters this value, one of three special actions will be taken: UNPRINT, EJECT, or SPACE(n). UNPRINT suspends printing of output. EJECT causes the printer to go to a new page before continuing printing. SPACE(n) causes n print lines to be skipped; if "n" is not specified, one line will be skipped.

A condition may be put on the EDIT, ACCEPT, REJECT, or ONKEY command, to restrict its execution to certain values for one or more keys. It may include NOT, to indicate that the condition is met when one or more keys has a value outside the range specified for it. Otherwise, the condition is met when the value of every key specified lies within the range. A condition without NOT is useful when you want a report to include only a few values of a key; a condition with NOT, when you want to include all but a few. Example:

ONKEY 8,SPACE(2),IF(8(811122,811132))

This command causes 2 print lines to be skipped when the Report Generator sees PE 811122 and PE 811132.

A condition on the ONKEY command should specify only the key whose value is changing or the keys to the left of it in the KEYS command.

#### FORMAT Command

Along with the ONKEY command the FORMAT command is used to control the appearance of the printed report. It has many operands. Some produce page headlines and footlines. A few change the width of columns. And others set the mode. Each of these FORMAT operands will be described later on, after the layout of the report page has been described.

#### Format of Report Page

The report page has 57 lines available to the user. (The Report Generator leaves the remaining 3 lines blank at the top and bottom of the page to allow for imprecision in the adjustment of the printers and for edge loss in reproduction.) Thirty-seven lines are reserved for reporting stubs and for use in headings generated by ATYPE or CTYPE operands of the FORMAT command. (See page 22.) The user is allowed 20 lines for headlines or footlines. Any combination of headlines and footlines may be used, just so they do not add up to more than 20.

The print line has 132 printable columns (character spaces) numbered from 1 at the left to 132 at the right.

The standard format has years across the page as the lowest level of detail. A line looking like

FY72 FY73...FY83

will be generated near the top of each page, above any units line saying "(\$ MILLIONS)" etc. The data field is a minimum of 9 columns wide per year. Titles occupy whatever print spaces remain to the left of the data fields. The width of this area arbitrarily varies between one and whatever is left after we use at least 9 columns for each year. If the title overflows the space reserved for it, a continuation character will be printed and the numbers will appear on the next line.

Titles are progressively indented 2 columns. If 9 keys are specified, up to 16 columns of indentation will occur. Most indentation will occur automatically, but to reflect any hierarchical nature of certain stubs, you may specify additional indentation in the stub description in the stub dictionary.

#### Operands Dealing with Headlines and Footlines

Lines on the page are reserved automatically for headlines or footlines whenever they are specified. Headlines and footlines are referred to by line. The line number is a positive integer for headlines, a negative integer for footlines. Examples:

1 top line on page  
-1 bottom line on page  
-12 twelfth line from bottom

Title, page number, PE number, or PE title can be put into the heading or foot. If the PE number or PE title is part of the heading or foot, the PE number or title will not be printed in the body of the report.

A FORMAT command using the TTL operand will allow the user to specify a title to appear in the heading or foot on the specified line, starting at the specified column. Example:

F TTL((I/O TEST LOGISTIC SUPPORT), 4, 2)

In this example, "4" is the line and "2" is the column.

The PAGENO operand causes a page number of the specified length in character spaces to be printed on each page, on the line and at the column specified. The Report Generator increments the number automatically.

The PENO and PETTL operands are used to produce a Program Element Summary Data (PESD) report. Whenever key 8 (PE) changes, PENO causes the OSD 6 character PE number to be generated and placed in the heading or foot, on the line and at the column specified, and causes a page eject to occur. "PETTL" is similar to "PENO" except that the PE title is printed (up to 36 characters long).

#### Operands Dealing with Width

The side-to-side allocation of print space on the page may be changed by means of the YEARWIDTH and TITLEWIDTH operands. With the YEARWIDTH operand the user can increase the number of character spaces allocated to each data field by specifying a number greater than 9, so long as the number of data fields times their width does not exceed the 132 print spaces available.

Data fields automatically appear as far to the right on the page as possible and the remaining spaces are reserved for titles. This could cause too wide a separation between the data and titles. With the TITLEWIDTH operand the width of the title space can be reduced to a specified number of characters, to bring the information reported closer to the items it is about.

Example:

F TW(38)

In this example titles are restricted to 38 character spaces in width.

#### Operands Setting the Mode

The following operands set the mode of the report by specifying whether it will be standard or nonstandard and whether certain other information will be printed.

S (or STANDARD) specifies the standard format. Since it is the default condition, it is seldom used. NS (or NONSTANDARD) calls for the nonstandard format - stubs across the page and years down. There is an option to specify a range of lines in either the heading or foot to put the stub titles from the stub description on. If (line,line) is not specified, the Report Generator will use the stub names and put them on the line the standard format has the years on. A maximum of 14 stubs may be printed. If "S" is specified last in the KEYS command, years are shown with "FY72", "FY73", etc., appearing as titles on adjacent lines. If other keys are specified to the right of the "S" in the KEYS command, each year is broken down as specified (in which case there are lines saying "TOTAL FY73" etc.). The HEAD and LABEL stub operands will be ignored. (See page 25.) The TOTAL operand of the FORMAT command should not be specified. An example of a report in nonstandard format is shown in figure 7. We got this report

	OMN	MPN
71113N PROCUREMENT OPERATIONS		
NAVORD		
FY74	4.2	.3
FY75	4.2	.3
•	•	•
•	•	•
•	•	•
NAVAIR		
FY74	13.9	1.2
FY75	12.8	1.2
•	•	•
•	•	•
•	•	•
NAVSUP		
FY74	28.4	1.1
FY75	19.7	1.1
•	•	•
•	•	•
•	•	•
NAVSHIPS		
FY74	35.2	
FY75	35.2	
•	•	
•	•	
•	•	
78017N MAINTENANCE SUPPORT ACTIVITIES		
NAVORD		
FY74	134.8	
FY75	134.7	
•	•	
•	•	
•	•	
NAVAIR		
FY74	90.0	1.4
FY75	83.1	1.3
•	•	•
•	•	•
•	•	•
NAVSHIPS		
FY74	85.1	
FY75	81.1	
•	•	
•	•	
•	•	
NAVELEX		
FY74	36.6	
FY75	31.1	
•	•	
•	•	
•	•	

FIG. 7: NONSTANDARD REPORT

by adding the FORMAT commands

F NS  
F TW(40)

to the required commands we saw earlier. We included a TITLEWIDTH FORMAT command because we have only two-stubs, they would otherwise be printed toward the right-hand side of the page, and this would leave a large space in the center if there were no reallocation of space side-to-side.

The TOTAL operand causes an across-all-years sum for each stub in standard reports. NOTOTAL is the default condition.

ATYPE, the default condition, causes headings of the form "(\$ MILLIONS)", "(\$ THOUSANDS)", "PERSONNEL", "FORCES" and "ACTUALS" to be printed above the occurrence of each particular type of number, as specified in the stub description. NTYPE suppresses all standard headings. CTYPE requires the user to create his own headings by use of the HEAD operand in his stub descriptions.

MBUCKS, the default condition, specifies that dollar results be printed in millions to the nearest tenth. KBUCKS specifies that dollars be multiplied by a thousand, rounded to the nearest thousand, and printed in thousands.

KEYS causes the key numbers (PU and PE) to be printed alongside their respective titles.

#### Minor Commands

The operand of DETAIL and FDETAIL commands is the "S" key or a key to the right of the "S" in the KEYS command. DETAIL causes all non-force stubs to be reported only to this level of detail (stub or less significant key, as specified). Force stubs will be reported to the lowest level of detail specified in the KEYS command. FDETAIL does just the opposite: force stubs are reported only to stub level of detail and all non-force stubs are detailed as in the KEYS command.

YEARS and FYEARS can be used to specify upper and lower limits on the years to be reported. Write the limit years as 4 digit numbers. If only one year is to be reported, repeat it, e.g. "1984, 1984". If no YEARS command appears in a report description, all the years on the data tape are reported for non-force data. If no FYEARS command appears in the report description the same years are reported for forces as are reported for non-forces.

The following four commands are global in the sense that their effect extends beyond the report in which they are included to all the reports that follow. Generally they will appear in the first report. These commands can be cancelled only by repeating the command with the addition of "OFF".

The TERSE command is used to suppress the printing of report commands and stub descriptions before the reports are printed. Error messages will still be printed.

The TIME command causes cumulative run time in seconds to be printed at the end of each report. Habitual use of this command will allow the user to be more efficient in his use of computer time. In addition, it will give him an accurate run time estimate for rerunning one report of a previous multi-report run.

The STATISTICS command causes the printing of ancillary statistics such as storage utilization, records processed, pages printed, etc.

The DEBUG command generates debugging information which will vary with the debugging action being taken. It is not intended for general use.

Lastly, two remaining commands are WRITE and ENDFILE.

The WRITE command can be used to cause the Report Generator to produce a data file of card images on tape for analysis by later programs or for printing many copies of a report without rerunning the program. The user must equip logical unit 19 for the output. The command cannot be used with a nonstandard report. The format of the output cards is as follows:

<u>Card columns</u>	<u>Information</u> <u>Label Cards</u>
2	1 (to denote label card)
4-5	least significant key number (0-9), for stubs
7	total indicator; 1 if a total, 0 if not
9-10	character spaces of additional indentation requested in stubs description, or 0
12-72	title from dictionary key (columns 4-5) — if 8, it is preceded by PE number in OSD format, and one blank (total of 7 characters)

### Number Cards

2	2 (to denote number card)
4-7	year (FY71, FY72, etc.)
10	number type: 1 = forces 2 = money (\$millions) 3 = personnel 4 = actuals
12-31	number in format E20.9

More often, the user will desire to reproduce many copies of a report without having to rerun the Report Generator. This can be accomplished by equipping an output tape to logical unit 1. No Report Generator commands are specified. A special program has been written to list this output tape.

The ENDFILE command causes an EOF mark to be written on the output tape produced by the WRITE command. The EOF mark will be written as soon as this command is read by the Report Generator, so it should appear at the end of a report. By use of an ENDFILE command at the end of each report in a multi-report run, it will be possible to skip to a particular report later on instead of having to print the entire output tape.

## CONSTRUCTING A STUB DICTIONARY

The stub dictionary contains stub names in card columns 1-6 and their descriptions in columns 8-72. A stub name is an abbreviation for the Report Generator results it represents. The name is one to six alphabetic or numeric characters, of which the first must be alphabetic.

### STUB DESCRIPTIONS

A stub description may be composed of three main parts, which deal with:

- (a) the stub's unit of measure (money, personnel, forces, or other)
- (b) a stub title to be printed
- (c) computing the stub.

The unit of measure of the stub is specified by coding a type operand: ACTUALS, PERSONNEL, FORCES, or MONEY. If no type operand is coded, the Report Generator assumes that the stub is a dollar amount.

Two other type operands are LABEL and HEAD. When the LABEL operand is specified, the stub description may have one part, with one TITLE operand and (optionally) one INCLUDE operand. No number is computed. If any stub specified in the INCLUDE operand is not zero or if the INCLUDE operand is omitted, the title is printed.

The HEAD operand is similar to LABEL. No TITLE operand is allowed. The title to be printed is specified in the HEAD operand, and becomes a type heading, which is automatically centered over the numbers. The HEAD operand may be used only with the CTYPE operand specified in the FORMAT command. (See page 22.)

The stub title to be printed is specified by a TITLE operand. The title (which may include blanks) is printed near the left-hand side of the page. A number, if present, specifies additional increments of indentation.

How to compute the stub may be specified by any of the following operands:

CONSTANT when the value is a constant. The number may be preceded by a minus sign. It may have a decimal point and a fractional part.

YEARCONSTANT when the value depends only on the fiscal year. Example: YC(1974, 3, 3.1, -.2) means that the stub is to have the value of zero for all years prior to 1974, of 3.0 in 1974, of 3.1 in 1975, and of -.2 in all later years.

EQUALS, which specifies adding, subtracting, multiplying, and dividing by the values associated with specific rows for stubs. Sequence numbers are indicated by integers, and stubs are indicated by their names. FORTRAN precedence and ordering rules apply. Example: E(1/TOA-1)).

ROWS, which specifies row values to be added into the sum. The nonzero rows are added.

INCLUDE (also referred to as STUBS), which specifies other stubs to be summed.

Type and title operands may be coded once in the stub description. They are usually put first and second, respectively. The part that tells the Report Generator how to compute the stub is often continued onto additional cards, because of the number of computational operands that must be coded. Prior to card column 73, a part must be terminated by a blank outside of parentheses or continued onto another card by coding a continuation character (down arrow on the CDC). If the stub description is so long as to require additional cards for a complete description, each continuation card must have the stub name in columns 1-6.

For example:

```
OMN  TTL(OPERATIONS & MAINTENANCE, NAVY),↓  
OMN  INCLUDE(OMNS, OMNA, OMNO, OMNSUP)
```

The first line or card establishes a title for OMN. The parenthesized title is coded with blanks within it. The comma is a delimiter that breaks the logic but continues the scanning. The arrow indicates continuation of the stub description onto the next card. The stub name is repeated on the continuation card. The second card tells the Report Generator to add the stubs listed in parentheses. That sum will become OMN. Since no type operand was coded (e.g., MONEY, TTL...), the Report Generator will conclude that the unit of measure is dollars.

The structure of operands in stub descriptions is summarized in table 4.

#### JOB SET-UP FOR CREATING OR CHANGING A STUB DICTIONARY

The following paragraphs describe how to create or change a stub dictionary by use of the CDC AESOP library management system. Creating or updating PU and PE dictionaries is done in much the same way; of course, PU and PE format rules would then apply.

**TABLE 4**  
**OPERANDS IN STUB DESCRIPTIONS**

Name	Abbrev.	Form
ACTUALS	A	
PERSONNEL	P	
FORCES	F	
MONEY	M	
LABEL	L	
HEAD	H	H(title)
TITLE	TTL	TTL(title) TTL((title),number)
CONSTANT	C	C(number)
YEARCONSTANT	YC	YC(year,numbers)
EQUALS	E	E(expression)
ROWS	R	R(range)
INCLUDE	I	I(stub names)
STUBS	S	S(stub names)
IF	—	IF(condition) IF(NOT,condition)

Creation of a New Stub Dictionary on Tape from Cards

The job set-up for creating a stub dictionary is as follows:

$\frac{7}{9}$ JOB

$\frac{7}{9}$ EQUIP, 47=(dictionary tape label name), DA

$\frac{7}{9}$ MACROSIM

\$TOLDM

\$BEGCODE SD

(deck of stubs)

\$ENDCODE

\$EOLB

There must be no blanks on any of the  $\frac{7}{9}$  cards.

TOLDM tells MACROSIM that no old dictionary tape exists. A new one will be created from the cards which lie between \$BEGCODE and \$ENDCODE. The output tape is equipped to logical unit 47. The "SD" in \$BEGCODE begins in column 10 and identifies the library being created.

#### Change to an Existing Dictionary

The job set-up for updating a stub dictionary is this:

$\frac{7}{9}$ JOB

$\frac{7}{9}$ EQUIP, 48=(name of dictionary to be updated), RO

$\frac{7}{9}$ EQUIP, 47=(name of new dictionary), DA

$\frac{7}{9}$ MACROSIM

\$CHANGE SD

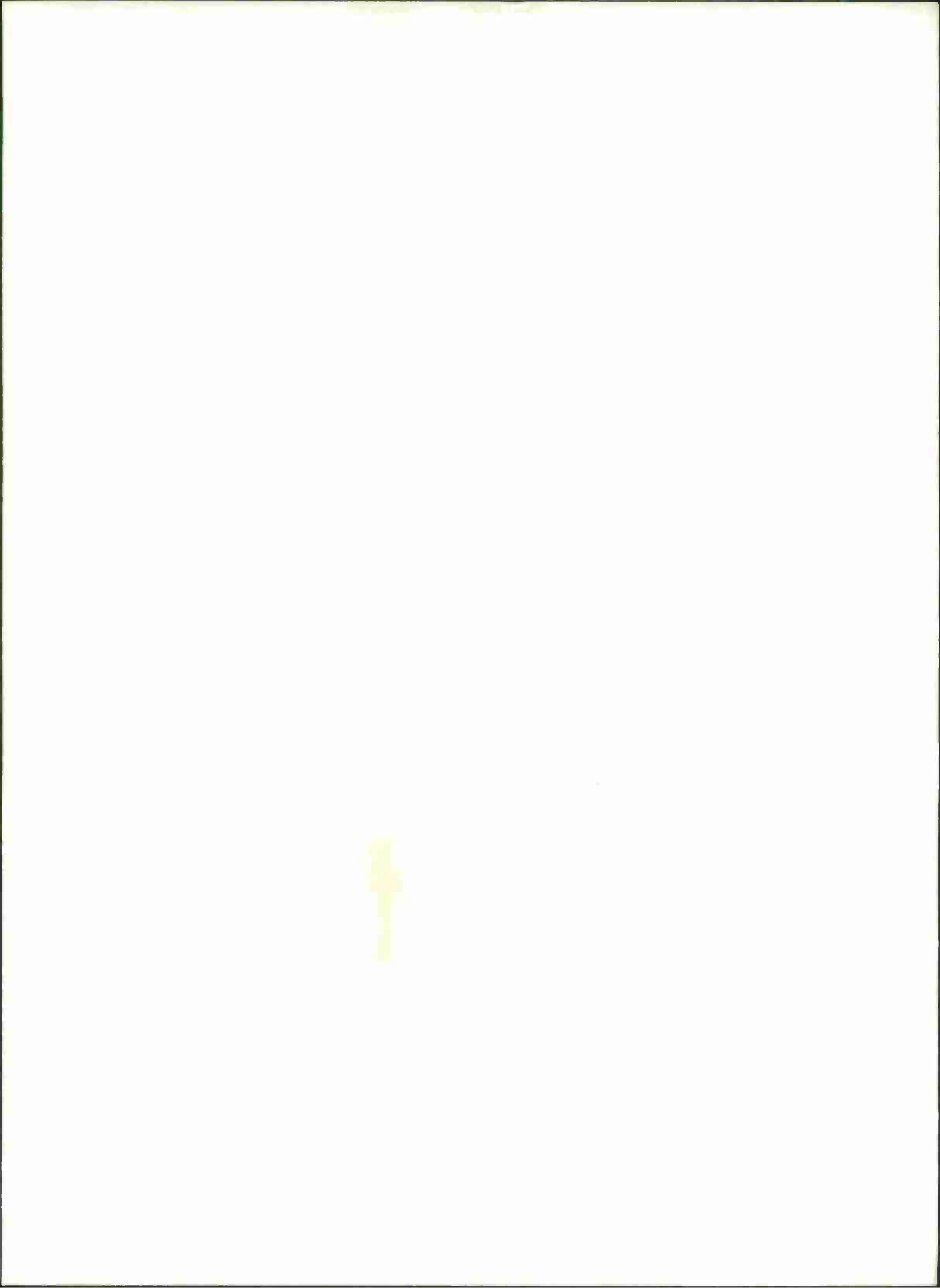
(stub descriptions to be added or changed)(row serial number)

\$EOLB

No blanks are allowed in any of the  $\frac{7}{9}$  control cards.

The name of the dictionary being changed is entered on the \$CHANGE card starting in card column 10. Stub descriptions for stubs to be added or changed are inserted in the deck following the \$CHANGE card. A row serial number indicating the dictionary line to be corrected or the place to insert the new stub must be entered in card columns 73-80 on each stub description card. A current dictionary listing should be consulted to pick off the serials of the lines to be corrected or to identify gaps where new stub descriptions can be inserted.

If the Report Generator is running on a time sharing system, it is possible to temporarily override a stub. This is accomplished by entering a new stub with the same name in front of the old one. The Report Generator will use the first stub and ignore any that follow with the same name. The old stub should not immediately follow the overriding stub because the Report Generator will interpret this to be a continuation of the definition of the new stub.



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